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Comparison of Selected Aviation Quality Standards, Military Specifications, Federal Aviation Administration Regulations and Joint Aviation Authorities Requirements with ISO 9002 and AS 9000

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INTRODUCTION

The quality performance of aircraft maintenance requires adherence to many regulatory, military and commercial industry standards. Aircraft are being maintained and returned to service throughout the world and the importance of standardized quality practices have become the focal point of many regulators and industry leaders.

This document provides a general comparison of selected military and commercial specifications and standards, as well as applicable requirements from the FAA and JAA, for establishing and assessing *quality programs*. The baseline for this comparison is ANSI/ASQC Q9002 (or the international quality standard ISO 9001) and SAE AS-9000. These standards were selected as the best baseline for comparison within the aviation industry because of their global acceptance and the scope and framework of its quality system requirements.

The military specifications (both rescinded in 1996 but remaining in use for many existing maintenance contracts) are

- MIL-Q-9858A, *Quality Program Requirements and*
- MIL-I-45208A, *Inspection System Requirements*.

The commercial standards are

- *Coordinating Agency for Supplier Evaluation (CASE), Air Carrier Section, Standard 1A, Component Repair/Overhaul Vendor Quality Program Requirements.*
- ASA 100, *Airline Suppliers Association Quality System Standard*.

The FAA requirements documents include

- FAA Advisory Circular 00-56, *Voluntary Industry Distributor Accreditation Program,*
- 14 CFR 145, FAR Part 145, Repair Stations,
- 14 CFR 43, FAR Part 43, *Maintenance, Preventive Maintenance, Rebuilding, and Alteration*, and
- 14 CFR 21, FAR Part 21, *Certification Procedures for Products and Parts*.

The JAA requirements documents include

- Joint Aviation Requirement JAR 145, *Aircraft Maintenance Organizations*

The intent of this document is twofold. First, the comparison highlights areas where the various standards, specifications, and regulations overlap in defining quality requirements. For example, all listed documents identify the general requirements for inspection and testing, item 4.10.1. Second, the comparison demonstrates where there are voids in requirements among these same standards, specifications, and regulations. For example, training, item 4.18, where all referenced documents address training except the two military specifications and FAR Part 21. Likewise, only ISO 9001, MIL-Q-9858A, and MIL-I-45208A address corrective actions, item 4.14.2.

Table -1 contains plain language questions for the 20 major elements of ISO 9000. Table -2 is a cross-reference of the five ISO 9000 series documents, their titles, and American designations. Table -3 provides a comparison of the military specifications, commercial standards, and applicable requirements from the FAA.

Table -4 provides an internal comparison within this baseline established by ISO 9001. This comparison lists the additions to ISO 9002 made by the 1997 Aerospace Standard AS9000. While adopting all elements of ISO 9002, AS9000 is intended to provide increased commonality of requirements based in ISO 9001 while increasing focus on unique requirements of the aerospace industry. AS9000 was recently submitted for recognition as an American National Standard.

Table -1. Key Questions Related to the 20 Elements of ISO 9002[a]

4.1 Management Responsibility: Who is responsible for product or service quality and supplier quality system effectiveness?	4.2 Quality System: Does the supplier's quality system support that it will deliver what it says, and clarifies how it does what it says?
4.3 Contract Review: Does the supplier's quality system ensure that the customer will receive what the marketing and sales sold to the customer?	4.4 Design Control: Does the design of the product ensure that it does what the supplier says and clarifies how changes are controlled?
4.5 Document and Data Control: Are key documents controlled in the supplier's quality system throughout design, manufacturing, and service?	4.6 Purchasing: Does the supplier's quality system make sure that bought parts/services are those specified and that its suppliers are reliable?
4.7 Control of Customer-Supplied Product: How does the supplier protect, store, maintain, and fix, if necessary, materials provided by the customer?	4.8 Product Identification and Traceability: How does the supplier ensure that the customer's parts do not get mixed up with the supplier's parts and that the parts are as specified and correct for the customer's project?
4.9 Process Control: What procedures does the supplier have in place to build the customer's product properly?	4.10 Inspection and Testing: How does the supplier ensure that the customer gets what it ordered and that it works as the supplier promised?
4.11 Control of Inspection, Measuring, and Test Equipment: How does the supplier verify that test equipment is accurate?	4.12 Inspection and Test Status: How does the customer know that the product was tested?
4.13 Control of Nonconforming Product: Does the supplier have a procedure for fixing or disposing of products that do not work or fit as required?	4.14 Corrective and Preventive Action: If a problem occurs, how does the supplier ensure that it does not happen again?
4.15 Handling, Storage, Packaging, Preservation, and Delivery: How does the supplier ensure that the customer's product was built correctly and that it will be protected from damage during storage and delivery?	4.16 Control of Quality Records: How are the quality of the customer's product and its input materials documented?
4.17 Internal Quality Audits: How does the supplier check on the effectiveness and correctness of its quality system?	4.18 Training: How does the supplier know that its people who built and tested the customer's product are qualified?
4.19 Servicing: If the supplier told the customer that it provides service for the customer's product, how will the supplier do that, and how will it make sure that servicing personnel are qualified?	4.20 Statistical Techniques: If the supplier is using statistical techniques to ensure the quality of the customer's product, how will the supplier ensure that the techniques are used correctly and that the results are within limits?

[a] John Rabbit and Peter Bergh, *The ISO 9000 Book, A Global Competitor's Guide to Compliance & Certification*, Quality Resources, 1993.

Table -2. Cross-Reference of ISO 9000 Standards and ANSI/ASQC Equivalents

ISO 9000 series	Title	ANSI/ASQC designation
ISO 9000:1994	*Quality Systems—Management and Quality Assurance Standards: Guidelines for Selection and Use*	ANSI/ISO/ASQC Q9002
ISO 9002	*Quality Systems—Model for Quality Assurance in Design/Development, Production, Installation and Servicing*	ANSI/ISO/ASQC Q9002
ISO 9002:1994	*Quality Systems—Model for Quality Assurance in Production and Installation*	ANSI/ISO/ASQC Q9002: 1994
ISO 9003:1994	*Quality Systems—Model for Quality Assurance in Final Inspection and Test*	ANSI/ISO/ASQC Q9003: 1994
ISO 9004:1994	*Quality Management and Quality System Elements—Guidelines*	ANSI/ISO/ASQC Q9004: 1994

Table -3. Comparison of Aviation Quality Standards, Military Specifications, and FAA Regulations with ISO 9002

Q (ISO) 9001 (1994)	MIL-Q-9858A (❶) MIL-I-45208A (❷)	CASE (❸) ASA 100 (❹) FAA AC 00-56 (❺)	FAR/JAR Part 145 (❻) w/FAR Part 43 (❼) w/FAR Part 21 (❽)
4.1 Management Responsibility			
4.1.1 Quality Policy		❸	
4.1.2 Organization	❶		❻, ❽
4.1.3 Management Review	❶		
4.2 Quality System			
4.2.1 General	❶	❸, ❹	❻, ❽
4.2.2 Quality-System Procedures	❶		❻, ❽
4.2.3 Quality Planning	❶	❺	❻, ❽
4.3 Contract Review			
4.3.1 General	❶		
4.3.2 Review			
4.3.3 Amendment to Contract			
4.3.4 Records			

Table -4. Comparison of Aviation Quality Standards, Military Specifications, and FAA Regulations with ISO 9002 (Continued)

Q (ISO) 9001 (1994)	MIL-Q-9858 (❶) MIL-I-45208A (❷)	CASE (❸) ASA 100 (❹) FAA AC 00-56 (❺)	FAR/JAR Part 145 (❻) w/FAR Part 43 (❼) w/FAR Part 21 (❽)
4.4 Design Control			
4.4.1 General	❶		❽
4.4.2 Design and Development Planning			❽
4.4.3 Organizational and Technical Interfaces			❽
4.4.4 Design Input			❽
4.4.5 Design Output			❽
4.4.6 Design Review			
4.4.7 Design Verification			❽
4.4.8 Design Validation			❻, ❽
4.4.9 Design Changes	❶		❽
4.5 Document and Data Control			
4.5.1 General	❶, ❷	❸, ❹, ❺	❽
4.5.2 Document and Data Approval and Issue			❽
4.5.3 Document and Data Changes			
4.6 Purchasing			
4.6.1 General	❶	❸, ❹	❽
4.6.2 Evaluation of Subcontractors	❶	❸	
4.6.3 Purchasing Data	❶	❸	❽
4.6.4 Verification of Purchased Product		❸	❽
4.7 Control of Customer-Supplied Product	❶, ❷		
4.8 Product Identification and Traceability		❸, ❹, ❺	❽
4.9 Process Control	❶, ❷	❸	❻, ❼, ❽
4.10 Inspection and Testing			
4.10.1 General	❶, ❷	❸, ❹, ❺	❻, ❼, ❽
4.10.2 Receiving Inspection and Testing	❶, ❷	❹	❽
4.10.3 In-process Inspection and Testing	❶		❻, ❽

Table -4. Comparison of Aviation Quality Standards, Military Specifications, and FAA Regulations with ISO 9002 (Continued)

Q (ISO) 9001 (1994)	MIL-Q-9858 (❶) MIL-I-45208A (❷)	CASE (❸) ASA 100 (❹) FAA AC 00-56 (❺)	FAR/JAR Part 145 (❻) w/FAR Part 43 (❼) w/FAR Part 21 (❽)
4.10.4 Final Inspection and Testing	❶	❸	❻, ❼, ❽
4.10.5 Inspection and Test Records	❶, ❷		❻, ❼, ❽
4.11 Control of Inspection, Measuring, and Test Equipment			
4.11.1 General	❶, ❷	❸, ❹	❻
4.11.2 Control Procedure	❶, ❷	❺	
4.12 Inspection and Test Status	❶, ❷		❻, ❼, ❽
4.13 Control of Nonconforming Product			
4.13.1 General	❶, ❷	❹	❻, ❽
4.13.2 Review and Disposition of Nonconforming Product	❶, ❷	❸, ❹, ❺	❻, ❽
4.14 Corrective and Preventive Action			
4.14.1 General			
4.14.2 Corrective Action	❶, ❷		
4.14.3 Preventive Action			
4.15 Handling, Storage, Packaging, Preservation, and Delivery			
4.15.1 General	❶		❻
4.15.2 Handling	❶	❹	❻, ❽
4.15.3 Storage		❸, ❹, ❺	❻, ❽
4.15.4 Packaging		❸, ❹, ❺	❻
4.15.5 Preservation			❻, ❽
4.15.6 Delivery		❸, ❹	
4.16 Control of Quality Records	❶, ❷	❸, ❹	❻, ❽
4.17 Internal Quality Audits	❷	❸, ❺	
4.18 Training		❸, ❹, ❺	❻, ❼
4.19 Servicing		❸	❻, ❽
4.20 Statistical Techniques	❶		
4.20.1 Identification of Need			❽
4.20.2 Procedures	❷		

Table -5. Additions Made by AS-9000 (1997) to ISO 9002

To ISO 9001 requirement	AS9000 adds a requirement for
4.1.2 Organization	4.1.2.4 Documentation for quality assurance activities
4.2.2 Quality-System Procedures	4.2.2.c. Availability of quality system procedures
4.2.3 Quality Planning	4.2.3.b. (1) Design, manufacture, special tooling
4.2.3 Quality Planning	4.2.3.f. (1) Added verification points
4.2.3 Quality Planning	4.2.3. (I) Subcontractor identification and selection
4.2.3 Quality Planning	4.2.3. (J) Process controls and control plans
4.4.9 Design Changes	4.4.9.1 Customer/agency approval
4.5.3 Document and Data Changes	4.5.3.1 Change management
4.6.2 Evaluation of Subcontractors	4.6.2.d. Use customer-approved special process sources
4.6.4 Verification of Purchased Product	4.6.4.3 Right of entry
4.6.4 Verification of Purchased Product	4.6.4.4 Delegations
4.6.4 Verification of Purchased Product	4.6.5 Quality system flowdown
4.9 Process Control	4.9.d. (1) Key characteristics
4.9 Process Control	4.9.h Accountability of controlled conditions
4.9 Process Control	4.9.i Authorized controlled conditions
4.9 Process Control	4.9.j Prevention, detection, and removal of foreign objects
4.9 Process Control	4.9.l Customer approval for special processes
4.9 Process Control	4.9.2 Production tooling
4.10 General Inspection and Testing	4.10.1.1 Control of subcontracted activity
4.10.2 Receiving Inspection and Test	4.10.2.4 Document certification test reports
4.10.5 Inspection and Test Records	4.10.5.1 First production article process
4.11.1 General Control of Inspection, Measuring, and Test Equipment	4.11.1.1 Tooling and personally owned acceptance equipment
4.11.2 Control Procedure	4.11.2.c. (1) Recall of inspection equipment
4.12 Inspection and Test Status	4.12.1 Controls for acceptance media
4.13.2 Review and Disposition of Nonconforming Product	4.13.2.1 Use of “use-as-is” and “repair” dispositions
4.13.2 Review and Disposition of Nonconforming Product	4.13.2.2 “Regrade” includes change in product’s identification
4.13.2 Review and Disposition of Nonconforming Product	4.13.2.3 Marking and disposition of scrap
4.13.2 Review and Disposition of Nonconforming Product	4.13.2.4 Timely reporting of nonconformances
4.16 Control of Quality Records	4.16.1 Records available for review
4.19 Servicing	4.19.1 Service management system
4.20.2 Procedures for Statistical Techniques	4.20.3 Valid sampling inspection system

Aviation Quality/Regulatory Comparison Cross Reference Table